DISSERTATION

FOR

THE AWARD OF DEGREE

MASTER OF SCIENCE

In

MEDICAL IMAGING TECHNOLOGY

SESSION 2022-2024

COMPARATIVE STUDY OF MAXILLARY AND FRONTAL SINUS VOLUME MEASUREMENT BY USING NCCT HEAD

By

SONAM TRIPATHI

MSc. In Medical Imaging Technology

Enrollment no-(950122475)

DEPARTMENT OF RADIO-DIAGNOSIS

SANTOSH DEEMED TO BE UNIVERSITY

NO. 1, SANTOSH NAGAR, GHAZIABAD-201009,

DELHI NCR, INDIA

SANTOSH
Deemed to be University

COPY RIGHT CERTIFICATE

DECLARATION BY THE CANDIDATE

I hereby declare that Santosh Deemed to be University, Ghaziabad, (U.P)shall have the right to preserve, use and disseminate this Dissertation title **"Comparative study of maxillary and frontal sinus volume measurement by using NCCT Head"** in print or electronic format for academic or research purpose.

Signature of Candidate

Date:

Place:

SANTOSH
Deemed to be University

DECLARATIONBY THE CANDIDATE

I hereby declare that this dissertation title **"Comparative study of maxillary and frontal sinus volume measurement by using ncct head"** is a bonafide genuine research work carried out by me under the esteemed guidance of my Guide **Ms. Neelam Rao Bharti** Department of Radio-Diagnosis (MIT) Santosh Deemed to be University, Ghaziabad, (U.P).

Signature of Candidate

Date:

Place:

CERTIFICATE BY THE GUIDE

This is to certify that the dissertation title **"Comparative study of maxillary and frontal sinus volume measurement by using ncct head"** is a bonafide genuine research work carried out by **SonamTripathi** in partial fulfillment of the requirement for the degree of **M.Sc Medical Imaging Technology** under my supervision and guidance in **Department of Radio-diagnosis(MIT)** Santosh Deemed to be University, Ghaziabad, (U.P)

GUIDE: **Name:Ms.Neelam rao bharti**

Designation: Assistant professor

Department: Department of Radio-Diagnosis

Santosh deemed to be university,

Ghaziabad-201009

SANTOSH
Deemed to be University

CERTIFICATE BY THE CO-GUIDE

This is to certify that the dissertation title **"Comparative study of maxillary and frontal sinus volume measurement by using ncct head"** is a bonafide genuine research work carried out by **Sonam Tripathi**in partial fulfillment of the requirement for the degree of **M.Sc Medical Imaging Technology** under my supervision and guidance in Department of Radio-diagnosisSantosh Deemed to be University, Ghaziabad, (U.P).

CO-GUIDE: Name:Mr. Himanshu mishra

Designation: Assistant professor

Department of Radio-diagnosis (Medical imaging technology)

Santosh deemed to be university,

Ghaziabad-201009

SANTOSH
Deemed to be University

CERTIFICATE BY THE HEAD OF DEPARTMENT

This is to certify that the dissertation title **"Comparative study of maxillary and frontal sinus volume measurement by using ncct head"** being submitted by **Sonam Tripathi** in partial fulfillment of the requirement for the degree of **M.Sc Medical Imaging Technology** is based on the bonafide work carried out by her in department of Radio-diagnosis, Santosh Deemed to be University, Ghaziabad, (U.P)

Name: Dr. Ashok kumar sharma

Designation: Professor and Head

Department of radio-diagnosis

Santosh deemed to be university, ghaziabad-201009

SANTOSH
Deemed to be University

ENDORSEMENT BY DEAN ACADEMICS OF THE UNIVERSITY

This is to certify that the dissertation title **"Comparative study of maxillary and frontal sinus volume measurement by using ncct head"** is a bonafide genuine research work carried out by Sonam Tripathi herself under the esteemed guidance of**Ms.Neelam rao bharti** Santosh Deemed to be University, Ghaziabad, (U.P)

Dr. Shalabh gupta

MBBS, MS

Dean academics

Santosh deemed to be university, ghaziabad-201009

SANTOSH
Deemed to be University

STATISTICIAN CERTIFICATE

This is to certify that the statistical analysis component of the thesis titled **" Comparative study of maxillary and frontal sinus volume measurement by using NCCT Head"** done by **Dr. Amod singh** in the **Department of community medicine** at Santosh medical college andhospital, Ghaziabad, has been conducted under my direct guidance and supervision.

All the statistical calculations of this study are authentic and correct to the best of my knowledge.

Name: Dr. Amod singh

Designation: Assistant professor and bio-statistician

Department of community medicine

Santosh deemed to be university,Ghaziabad-201009

SANTOSH
Deemed to be University

ANTIPLAGIARISM DECLARATION /UNDERTAKING

I, **Sonam Tripathi**, at this moment, declare that the present thesis entitled **"Comparative study of maxillary and frontal sinus volume measurement by using ncct head"** submitted by me to Santosh deemed to be University is an original research work. I also at this moment declare that there is a similarity in contents found 1%, after plagiarism check.

(Student Name with Signature) **(Guide Name With Signature)**

I have verified the contents of the thesis through authentication by Drill built and it shows a similarity of less than 10% in the plagiarism check.

(Signature of Dean Research)

ACKNOWLEDGEMENT

The thesis to successfully finish the project. My sincere thanks is extended to **HOD, Dr. Ashok Kumar Sharma**, my guide, **Ms. Neelam Rao Bharti**, and Co-Guide**, Mr. Himanshu mishra**, for their important assistance, experience, and steadfast support during the research and preparation of my thesis.Under the heading **"Comparative Analysis of Maxillary and Frontal Sinus Volume Measurement Using NCCT Head,"** Their support and enlightening criticism have been crucial in molding my piece.

To **Dr. Bhawna solanki**, who helped me successfully finish my thesis and offered me helpful advice regarding my project, I would like to thank you my profound gratitude also goes out to my instructors, whose knowledge and guidance have tremendously enhanced my academic career.

I also want to express my gratitude to the **Department of radio-diagnosis** faculty and personnel, whose help and collaboration have been invaluable. I am appreciative of my fellow batch mate's friendship and support, which have enhanced and enjoyed this trip.

I owe my family a great deal because of their unwavering love, tolerance, and support, which have given me the willpower and inspiration to keep going.

Finally, I would want to express my gratitude to the patient attendant who took part in this study; I much appreciate their willingness to support medical research.
.

ABSTRACT

Background: In order to differentiate nonpurulent sinus discharge from muco-purulent sinus secretions, we previously shown that acoustic streaming might be produced in non-purulent sinus secretions. For this reason, we suggested using computed tomography in cases of sinus infection. To keep working toward creating a therapeutically relevant. We must ascertain the various dimensions of the PNS using CT, particularly their thickness near the canine fossa, on the anterior wall of the MS measures. This is the first report that we are aware of based on measurements of the orbital floor, frontal depth, anterior wall thickness, and canine fossa.
Objectives: Comparative study of maxillary and frontal sinus volume measurement by using ncct head. To comparative automated and manual calculated volume. Volume measurements differentiate with dentations and non-dentition.
Methods: A radio-technologist estimated the parameters obtained from head CT images for 284 maxillary and frontal sinuses on an independent basis.

Result: Males and females had relatively similar maxillary sinus volumes, with a mean value of 284 mm. Age or side had no statistically noteworthy effect on the capacity of the MS. The maxillary sinuses' automatically estimated volume did not exceed the volume that was computed. For each of the several measurements made during this investigation, there was a top of inter-observer consensus.

Conclusion: In my opinion, my findings are essential for the advancement of forensic, therapeutic, and pathological research in patients, as well as for gender identification.

Keyword – Maxillary sinus, frontal sinus, orbital floor, canine fossa,

LISTS OF TABLES

Sr. no.	Caption	Page No.
1.	Shows the difference between manually and automated calculated volume in rightmaxillary sinus.	36
2.	Shows the difference between manually and automated calculated volume in left maxillary sinus	37
3.	Shows difference between manually and automated calculated volume of both sinuses.	38
4.	Shows measurement difference between frontal sinus depth, anterior wall thickness, canine fossa ap, and orbital floor thickness.	40
5.	5.Difference between gender in manually calculated volume of maxillary sinuses.	41

LISTS OF GRAPHS

Sr. no.	Caption	Page No.
1.	Shows the difference between manually and automated calculated volume in right maxillary sinus.	36
2.	Shows the difference between manually and automated calculated volume in left maxillary sinus	37
3.	Shows difference between manually and automated calculated volume of both sinuses.	39
4.	Shows measurement difference between frontal sinus depth, anterior wall thickness, canine fossa ap, and orbital floor thickness.	40
5.	Difference between gender in manually calculated volume of maxillary sinuses.	41

LISTS OF FIGURES

Sr. no.	Caption	Page No.
1.	Diagrammatic illustration of a standard CT scanner setup.	18
2.	Ostiomeatal unit line drawing: nasal septum (NS), ethmoidal infundibulum (INF), ethmoidal bulla (B), uncinate (U), maxillary sinus (M), middle turbinate (2), ethmoidal infundibulum (INF), and middle meatus.	19
3.	Measurements of manual and automated calculated data.	34

ABBREVIATION

Sr No	Abbreviation	Full form
1.	NCCT	NON-CONTRAST COMPUTED TOMOGRAPHY
2.	FS	FRONTAL SINUS
3.	MS	MAXILLARY SINUS
4.	CT	COMPUTED TOMOGRAPHY
5.	PNS	PARANASAL SINUS
6.	MSV	MAXILLARY SINUS VOLUME
7.	CBCT	CONE BEAM COMPUTED TOMOGRAPHY
8.	INF	INFUNDIBULUM
9.	MSCT	MULTI-SLICE COMPUTED TOMOGRAPY
10.	NS	NASAL SEPTAM
11.	MMCV	MAXILLARY MANUAL CALCULATED VOLUME
12.	MACV	MAXILLARY AUTOMATED CALCULATED VOLUME
13.	FD	FRONTAL DEPTH
14.	FAWT	FRONTAL ANTERIOR WALL THICKNESS
15.	CFAP	CANNINE FOSSA ANTERIO-POSTERIOR
16.	OFT	ORBITAL FLOOR THICKNESS

TABLE OF CONTENTS

S. No.	Chapter	Page no.
1	INTRODUCTION	1-4
2	AIM AND OBJECTIVES	5
3	REVIEW OF LITERATURE	6-14
4	MATERIAL AND METHODS	15-16
5	RESULTS	17-24
6	DISCUSSION	25
7	CONCLUSION	26
8	BIBLIOGRAPHY	27-29

CHAPTER-1

INTRODUCTION

1.1 Introduction of computed tomography

1.1.1 History

The word tomography is not new. During the early 1970s, medical radiology underwent a transformation with the introduction of computed tomography (CT). In order to photograph the brain, DR. G. N. Hounsfield created the first experimental CT machine in England in 1971 [Hounsfield, 1980].For the first time, doctors could now acquire excellent tomographic (cross-sectional) pictures of the body's interior organs. Eighteen manufacturers fought for the global crash-test market over the ensuing ten years. The world of technology has grown immensely, and even now, CT is still developing and exploring new possibilities.[1,2]

1.1.2 Principle of CT

From a huge number of measurements of x-ray transmission through the patient (referred to as computation data), computed tomographic images are reconstructed. The images that are produced are tomographic "maps" of the linear attenuation coefficient of the x-ray. The subsequent section discusses the statistical techniques utilized to alter the CT representation based on calculation data. This section describes the current scanner's hardware and instrumentation. In about five minutes, the computing data were obtained, and in about twenty minutes, the imaging was transformed. [2,3]

1.1.3 Advancements in CT

Since then, there have been significant advancements in CT technology, making it an excellent imaging method with thousands of advantages worldwide for almost every aspect of the body. The image is altered in 3 to 5 seconds, and computation data is typically obtained in around 1 second. A unique type of scanner, which will be explained later, may obtain the computation data for a single tomographic figure in 50 milliseconds[4,5]. Figure 1 depicts a standard contemporary CT scanner, while Figure 2 shows a standard CT image. CT systems' primary function is to take a very large number—roughly 500,000—of extremely exact measurements of the x-ray transmission through the patient in a well regulated geometry. [6,7].

A gantry, a patient table, a control console, and a computer are repeatedly establish in a basic structure8,9]. The genesis of the gantry, which houses the x-ray source, x-ray detectors, and data-accession structure, day back to the early 1920s, when several experimenters were generate methods for imaging a specific layer or part of the body. By apply image reconstruction from projections to cross-section in a specificway, CT overcomes clarity and detail limitations. The view is projected onto a detector, which then transfer signals to a computer for processing. The internal structure of the thing is represented in sharp, clear graphics by the computer.[10,11] This method permits the CT scanner to exploration a broad of images of the anatomy or organ system under investigation, together with virtual reality images, three-dimensional (3D) images, and cross-sectional two-dimensional images. The basic component of the CT system is a crash computer. Over time, the CT computer has had a number of alternations. When diagnosing sinusitis and other disorders, computed tomography is critical [12,13].

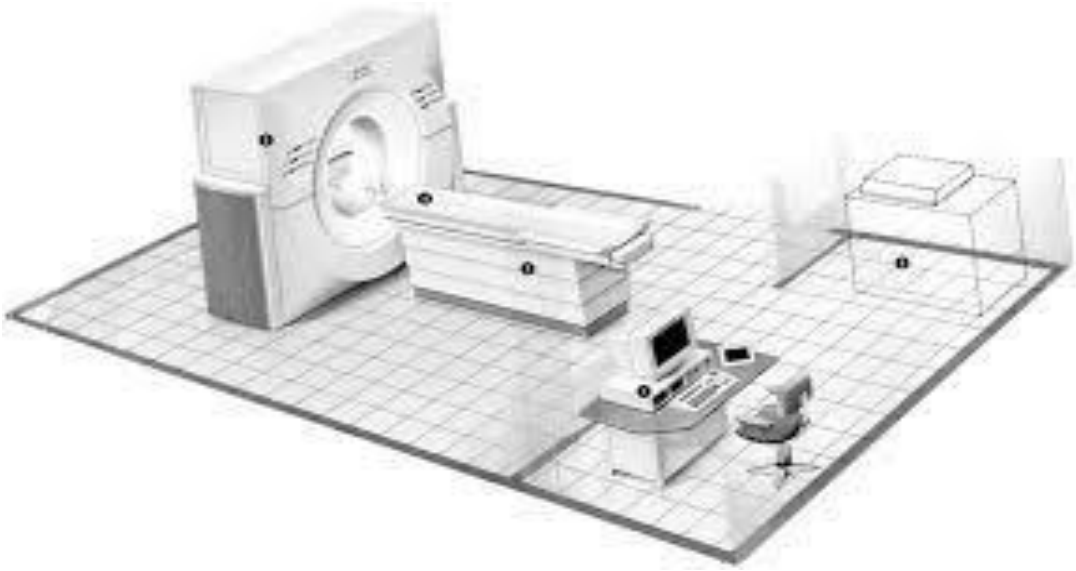


fig (1) Diagrammatic illustration of a standard CT scanner setup.

1.2 Introduction of PNS sinus

A great tool for looking at maxillary sinuses is computed tomography (CT). The FS, ES, SS, and MS, which has the biggest volume, are the four pairs of sinuses that make up the complicated anatomical structure of the paranasal sinuses [14].

1.2.1 Maxillary Sinus

PNS is biggest in the human body . The sinuses appear first, developing about an intrauterine life of ten week. It opens in the nasal cavity's middle nasal meatus. When the baby's size increases from birth until the eruption of the deciduous teeth and then again with the permanent teeth, the pneumatization of the sinuses ends when the third molars entirely erupt [15]. That is, Szilvassy proposed different maxillary sinus forms. triangular, foliage. renal and scapular shapes. According to reports, both boys and females have the most frequent sinuses, which are triangle-shaped. Its size, shape, and location varied substantially amongst individuals. Thus, gender can be ascertained using the maxillary sinus method.[6]. Gender identity and remains identification have been achieved through the use of sinus radiography.[16]. As people age, their maxillary sinuses vary in size and volume. Occasionally due to illnesses, and occasionally as people age[17]. It is recognized that diseases involving dental structures and associated periodontium, neoplasias, and infections that start in the nasal or oral cavities can affect the maxillary sinuses. Sinusitis is the term used to describe an infection that affects the sinus cavity. This disorder may obstruct the sinus ostium, which complicates the extrusion of sero-mucous secretion from the sinus cavity[18].

1.2.2 Frontal Sinus

The frontal sinuses are two funnel-shaped pneumatic chambers located in the temporal bone's squamous portion[19]. Rarely does a bony septum which divides two frontal sinuses occur in the midline. In the 2nd trimester of intrauterine life, frontal sinuses begin to protrude from the area of the nostril's frontal cavity. Due to the distinct development of each sinus, frontal sinuses are rarely symmetrical. It is well recognized that the frontal sinus's pneumatization varies greatly. There have been reports of anatomical variances in frontal sinus morphology in a number of global groups [20]. the various par nasal sinus anatomical dimensions (coronal, axial, and sagittal) as determined by computed tomography imaging. The architecture, size, and abnormalities of the paranasal sinus can be captured by head imaging and paranasal sinus computed tomography. The paranasal sinus can be volumetrically calculated manually, semi-automated, or automatically.[21] Situated on different sides of the head, the cranial and caudal systems are divided by a short maxillary septum and do not connect frequently. A narrow maxillary septum divides the cranial and caudal systems, which are located on either side of the skull and do not often communicate. [22]

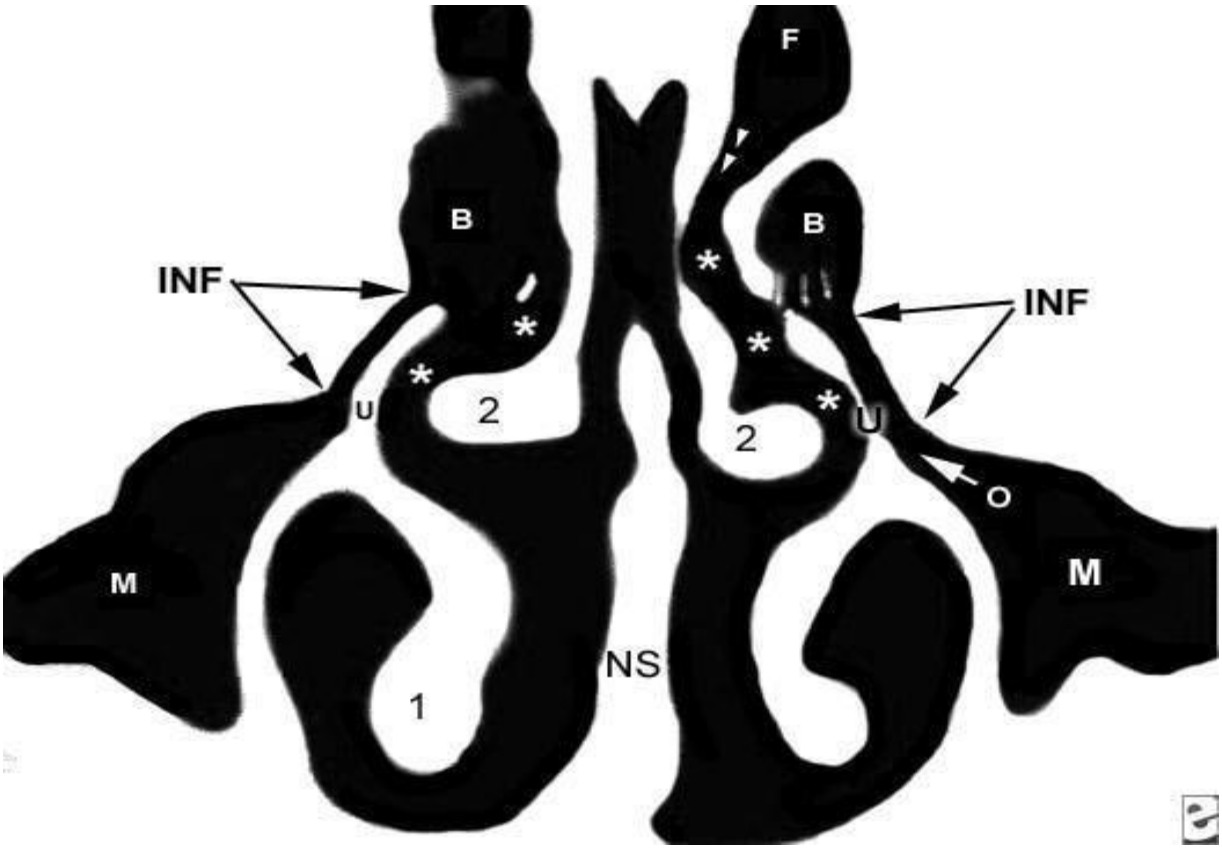


Figure 1.1 Ostiomeatal unit line drawing: nasal septum (NS), ethmoidal infundibulum (INF), ethmoidal bulla (B), uncinate (U), maxillary sinus (M), middle turbinate (2), ethmoidal infundibulum (INF), and middle meatus (*).

In the early 1990s, it was advised to work up paranasal sinus pathology using computed tomography rather than plain radiography. Since then, a pre-operative CT scan is now required for sinus surgery. In order to navigate during functional endoscopic sinus surgery (FEES), CT has become a crucial tool [23].Considerable progress in volume computation has resulted from the measurement and accurate evaluation of tissue size during reconstructive surgery. Additionally, measuring the volume has various medicinal purposes, such as figuring out how gum bone loss and maxillary sinus mucus thickness relate to one another. The proper development of the PNS is shown by the regular form of the facial bone. Thus, it may be argued that the maxillary sinuses' proper growth may be indicated by the face topography [24].

1.3 Role of Imaging In study of Sinus

Recent investigations to assess the PNS's dimensions in relation to traditional x-rays in live and Human corpses have placed a strong emphasis on computed tomography scan imaging [25,26]. The benefits of using a three-dimensional CT scan To gauge the dimensions of the frontal & MS include the ability to diagnose & treat PNS diseases such sinus tumors, nasal polyps, and sinusitis problems. Loss of teeth causes the maxillary sinus to become pneumatized and vary in volume, which is a sign that bone grafting should be used to repair bone [27]. It is recognized that pathologies with a traumatic origin, neoplasias, and infections involving dental structures and their periodontium that start in the nasal or oral cavities affect the maxillary sinuses. An infection that develops in the sinus cavity is called sinusitis. It may become difficult for sero-mucous discharge to leave the sinus cavity due to this condition's ability to clog the sinus ostium[28]. An odontogenic etiology may be present in sinus infections caused by bucco sinus fistulas. dental tumors or cysts caused by periodontal or endodontic conditions. Anatomic obstructive nasal disorders brought on by allergies can also result in hypertrophy of the adenoids and nasal mucosa, which can lead to non-odontogenic sinus infections. A deviation of the nasal septum, as well as modifications to the size and location of the sinus ostium, concha bullosa, and/or hypertrophic bulbous protrusion, are among these diseases [29, 30].

NEED FOR STUDY

Understanding about normal sinus and anomalous sinuses is the necessity for this research. Rather than being examined for scientific reasons, every patient will be investigated for clinical reasons. Surgeons, forensic specialists, and radiologists would find great use in this study. to ascertain the distinction between the volume estimated manually and automatically. This study demonstrates the anatomical and morphological variations in the right and left paranasal regions. The complicated anatomical structures vary from individual to person. This study uses sinus volume to assist forensic experts assess gender differences. Additionally, this study aids in the diagnosis of sinus diseases. Additionally, aid in understanding the correct anatomy of the frontal and maxillary sinuses for educational purposes. This research contributes to our understanding of how sinus morphology differs among demographic groups, ethnic groups, and environmental factors. This study also demonstrates how the volume of the normal sinus varies with age, making anomalies easier to spot.

CHAPTER-2

AIM AND OBJECTIVES

AIM

A comparative study of maxillary and frontal sinus volume by using NCCT HEAD.

OBJECTIVE

1. To compare the estimated volumes of the MS and FS obtained manually and automatically.

2.To ascertain which gender and age group suffers from sinusitis the most frequently.

3. The influence of dentition on volume calculations.

CHAPTER-3

REVIEW OF LITERATURE

3.1 Paweł Piotr Grab et al (2024) -The research comprised a cohort of twenty-five participants who had MMA surgery. Two weeks prior to surgery and six months afterward, CT scans of the head and neck were conducted. DICOM files that were get examined utilizing several software packages to determine the maxillary sinus volume and medium maxillary sinus mucosa thickness. Findings: There was a statistically noteworthy decrease in maxillary sinus volume ($p = 0.015$). The modification in the the maxillary sinus mucosa's median thickness was not statistically noteworthyThe group's median sella-nasion-A point angle (SNA angle) value increased between 80.2 and 83.4 degrees. A small negative correlation was observed between the SNA delta and the maxillary sinus volume delta. Spearman's rank coefficient: ($\rho s = -0.381$, $p = 0.060$). In conclusion: The MMA surgery results in a decrease in the maxillary sinus volume. The magnitude of the MS volume drop and the forward migration of the maxilla might be related.

3.2 Asma Sulaiman et al (2023) - A retrospective assessment was conducted on 1220 Computed tomography images of the FS from 610 individuals who were explore at Sultan Qaboos University Hospital in Oman between jan 2019 and dec 2020. The sinus frontal examination was categorized using the scheme put forth by guerram plus others. The Chisquare analysis was employed to ascertain the impact of sexual activity Regarding the unilateral occurrence, medium-sized frontal sinus (13.3%) was the most common category found, followed by hyperplasia (7.9%), hypoplasia (5.4%), and aplasia (2%) categories. Likewise, when present bilaterally, the most typical FS type found was average-sized (53%), with hyperplasia coming in second. categories of aplasia (2%), hypoplasia (3.4%), and 13.1%. Left and right In 2.1% and 1.8% of patients, frontal sinus aplasia was found. correspondingly. Regarding the impact of sex, the left u/l ($p<0.01$) and In females, the b/l hypoplasia was substantially higher ($p<0.05$). Conversely, the b/l and the left u/l ($p<0.01$) In males, hyperplasia ($p<0.05$) was more prevalent. In the clinical context, the baseline FS category frequency data given in this study is useful for diagnosing sinusitis.

3.3 Chathula Wickramasinghe et al (2022) - A MSCT's scanner at the Teaching Hosp. Peradeniya produced 300 NCCT skull images for this retrospective investigation. This age- and sex-similar sample, which is separate into 7 age groups (20–29, 30-39, 40–49, 50–59, 60–69, 70–79, and 80–89), was chosen using sequential sampling. Frontal sinus values on the right and left In order to measure (length, height, width of each sinus, and total width), the Radiant Digital Imaging and Communications in Medicine Viewer 2020.2.3 program was used. and the CT scans were used to determine sex and age. The t-test was used to examine the relationship between the variables and model of binary logistic regression.59% of the 177 participants in our study were men, and their average age was 57.94 years. There was a statistically significant difference in the means of the left and right sinus values. Frontal sinus parameters were shown to be statistically snoteworthy correlated with sex; male values were greater than female values. There isn't a strong correlation between the observer's age and sinus size.

3.4 Kikue Yamaguchi et al (2022) - They chose individuals who had a u/l free-end saddle performed between April 2019 and December 2020 and who had undergone maxillary sinus augmentation to have two or more missing teeth. CBCT was used to calculate the MSV and NSD (Cone beam computed tomography). We contrasted the presence/absence connections.

employing the Wilcoxon t-test on each patient's set of teeth and NSD with MSV bilaterally. P-values less than 0.05 shown statistical significance. In total, 30 patients (12 men and 18 women) with sinusitis were included in this study. Men's average age was 60.4±3.7 years and women's average age was 59.2±4.5 years. The patient's age ranged from 40 to 77 years. An average of 2.98±1.01 teeth were absent. Of the participants, thirteen had two missing teeth, and seventeen had three or more. NSD was seen in thirteen patients (30%). The NSD did not have an impact on MSV (p=0.150) as the mean MSVs on the ipsilateral and contralateral sides of the NSD were 21.50±3.84 cm3 and 22.10±3.56 cm3, respectively. In the edentulous group, the MSV was considerably lower (p=0.00036) compared to the non-edentulous group, which had an average mean MSV of 21.58±3.89 cm^3 and 21.77±4.30 cm3, respectively. Even though this study was a small preoperative investigation, the three-dimensional measurement of the maxillary sinus with CBCT in individuals with partial dentition demonstrated that NSD was unrelated to MSV. MSV was significantly reduced in cases where teeth were missing.

3.5 Erli Sarilita et al (2021- The Department of Radio-diagnosis at Hasan Sadikin Hospital's repository provided 802 retrospective computed tomography scans of patients who were mention for a variety of motive between 2019 and 2020. The Universities Padjadjaran Research Ethics Committee accepted the study's protocol (477/UN6.KEP/EC/2020). The SOMATOM Definition DS dual source 128 (Siemens, Erlangen, Germany) was used to capture these pictures. Strict inclusion and exclusion criteria were used to choose CT data sets from patients between the ages of 0 and 25. Only data sets within the paranasal sinus field of view are included. This study removed CT pictures having fractures involving paranasal sinuses, insufficient image quality, and documented craniofacial pathology on the data. Following a thorough filtering process using the criteria, 97 samples were chosen for the ultimate assessment. The CT scans' slice thicknesses of 1.0–1.5 mm were employed. Using the ITK-SNAP 3.0 program (Cognitica, Philadelphia, PA, USA), MSV data were retrieved and digital imaging and communications in medicine files were rebuilt. In order to pick the sinus region the reason of interest from the axial, coronal, and sagittal slices for semi-automatic divison, a ROI volume was constructed using active contour divison.

3.6 Abdalla Ahmed Elamin et al (2021 **) -** Observational Retrospective Study: With consent from the Human Research Ethics Committee, an observational retrospective study was carried out at the Department of Radio-diagnosis at Royal Care Hospital in Khartoum, Sudan, from August 2018 to July 2019. An axial CT picture of the PNS was obtained with a Toshiba Aquilion 64 multislice CT scanner. The projection had a thickness of 1 millimeter, a slice reformation interval of 0.600 millimeter, and it was parallel to the orbito-meatal line. The multiplanar reconstruction (MPR) processing of the workstation was used to create the coronal and sagittal planes. To get high-quality data, advanced technological elements were used, including a bone window (1500 HU window width and 200 HU window level), collimation of 64×0.625, rotation duration of 1.0 sec, and 120 kVp and 210 mAs. Perfect technical details on the CT scan imaging procedure were given to the patients.

3.7 Lisa Köhler et al (2021) **-** It is unclear how big paranasal sinuses are and how they communicate in ponies and small horses, despite sinus disease's clinical significance and frequent occurrence. Computed tomography (CT) datasets of 12 fits adult Shetland ponies were formed in three dimensions (3D) and analyzed in order to assess the sinonasal communication and investigate the posture and vol. of the paranasal sinuses. Head width and length measurements were made in a linear fashion. All sinus compartments were modeled in three dimensions using semi-automatic segmentation. The seven sinus compartments were subjected to volumetric measurement, followed by statistical analysis. The left and right sinuses' sinus

volumes were inspect, and the relationship between age and head size was assessed. Large horses and Shetland ponies shared a similar paranasal sinus system in terms of shape and structure. The rms, vcs, cms, dcs, mcs, fs, and ss are the 7 sinus chambers on each side of the skull that have been identified. The All 12 exhibited the presence of a maxillary septum-formed caudal system and bilateral cranial system. There was no discernible dissimilarity in the volumetric sizes of the left and right sinuses ($p > 0.05$). A favorable relationship between Both the head length and the size of the paranasal sinuses were displayed. Age and sinus volumes may be related. not demonstrated in mature ponies older than six years Communication was found between individual sinus chambers. Additionally, it splits into a rostral and a caudal canal, communicating with the nasal opening through the naso-maxillary aperture and a common sino-nasal channel. There was a caudolateral canal visible.

3.8 M. Gulec1 et al (2020) - The CBCT scans of patients who were referred to the Department of Oral and Maxillofacial Radiology, Faculty of Dentistry, Necmettin Erbakan University, for a variety of reasons, were used in this study from 2013 to 2019. The Faculty of Dentistry's Ethics Committee gave its approval for this investigation. A retrospective analysis was conducted on three thousand CBCT pictures from the radiology repository. Age was not taken into consideration while examining the CBCT pictures; only those that showed adequate diagnostic features were included in our analysis. Any evidence of missing teeth in the upside or low side jaw (apart from the 3rd molar teeth), pathology in the maxilla-facial region, bone pathology , artifact figures with low diagnostic quality, maxillary sinus or graft surgery, maxillary sinus pathology, skeletal asymmetries, cranio-facial injuries, and developmental abnormality like palatal cleft are the exclusion criteria of our study. With a power of ninety percent and a two-sided alpha 0.05, the initial sample size of 133 patients was calculated using sophisticated software, assuming a MSV of 16.74 ± 5.28 cm3 based on a prior research [30]. Although 65 people were the expected sample size, 133 participants were ultimately chosen to be listed for the sample size due to the possibility of follow-up loss. The 133 participants in this retrospective volumetric CBCT research ranged in age from 8 to 51, with 84 females and 49 men. Each person's left and right MSVs were computed independently (the same observer recorded 266 MSVs in total)

3.9 Mario Pe´rezSaya´nsIDet al (2020) -For 214 individuals with clinically unilateral sinus diseases, a single-center consideration retrospective clinical research was undertaken. Measurements of the afflicted sinus's linear (millimeter), area (milimeter2), and volume (milimeter3) were obtained from CBCT images, as well as from the contralateral sinuses. Using PAS or Groccot stains along with hematoxylin/eosin, a histopathological analysis was conducted. The lesions were categorized as polyps, reverse papillomas, fungal sinusitis, cysts, mucocele, nonspecific sinusitis, & miscellaneous lesions. The statistical analysis employed the chi-squared test, Pearson test, and ANOVA for independent samples. 50 patients (age 43.6 years (SD = 18.3), 28 men and 22 women) had a total of 100 sinuses measured, 50 of which were diseased and 50 of which were healthy contra lateral sinuses. The afflicted sinuses had a three-dimensional occupation volume of 97.1 mm3 (62.5%), while the healthy sinuses had a volume of 40.6 mm3 (22.8%) ($p<0.0001$). The sinus's medial-lateral breadth in the group with cysts had a substantially higher frontal plane (32.4 mm, CI: 23–41.8 millimeter).In period of medicine, there is no difference between the 3D % computed using specialized sophisticated software and the worldwide % of occupation established using the traditional manual determination approach.

3.10 Camila S. Dassi et al (2020- The FS is primarily affected by benign diseases such as mucocele, osteomas, and chronic rhino sinusitis (CRS). On the other hand, a considerable range

of malignant tumors can also impact this area and present a big technical challenge to the surgeon. The anatomical, volumetric, and dimensional aspects of the FS are diverse. The FR represents the point of maximum narrowing from an endoscopic perspective. The ethmoid cells that surround the FR and frequently obstruct sinus drainage must be understood in order to gain access to this area. Wolfgang Draf categorized the endoscopic techniques into four categories (I, IIa, IIb, III) and stated that most illnesses affecting the FS may now be addressed because to the advancements in these techniques. In summary Conditions affecting the FS and FR that are both benign and malignant can be effectively handled if one possesses a deep comprehension of the anatomy of the FS and FR, a customized strategy that determines the most effective surgical method in each situation, and the suitable equipment to work in this area.

3.11 Andrew Whyte et al (2019- We assessed pertinent literature from 2000 to 2019 regarding the architecture of the maxilla and maxillary sinus, the development of the paranasal sinuses, and the physiology of the sinonasal cavity. Recent literary works were given special attention. Numerous imaging-based investigations carried out recently have allowed for new insights into the development of the maxillary sinus, other paranasal sinuses, and the midface. This paper emphasizes the core physiological principle of mucociliary clearance and its significance for sinus health.The upper and lower airways combine to form a shared mucosal part, which involves the paranasal sinuses. A thorough comprehension of the maxillary region's soft tissue and neurovascular connections sinus to the external carotid artery, deep facial spaces, and trigeminal nerve branches artery, respectively, in order to assess and document imaging related to the MS. The base of the caudal maxillary teeth are closely linked to the MS; mucosal illness and sinusitis with an odontogenic aetiology are associated with a high frequency, which is recognized today. Furthermore, knowledge of the alveolar process's anatomy, the maxillary sinus's alveolar recess' morphology, and the neurovascular supply are crucial for both objective surgical treatment for the sinuses and side effects following oral surgery. Doctor report figures involving the PNS and mid-face must have a basic understanding of the growth, physiology, anatomically, and connections of the maxillary sinus as shown by multi-modality imaging.

3.12 Joe Iwanaga et al (2018**) -** The MS is approximately 7.0 mm deep, 4.0 mm tall, and 2.7 mm wide at birth. Numerous factors influence the height of sinus development, including: the orbit wall's resistance to the eyeball's pressure, the grip on the facial muscles' lesser part of the maxillary, and the emergence of long-term imprisonment .The MS ages 1 to 8 years old are when it grows the fastest. expanding inferiorly and laterally beyond the infraorbitalis canal to the inferior meatus's medial aspect. three years old years, the face muscles' downward pull is still present. force the maxillary bones together. Due to increasing pneumatisation, the upside of the sinus first appears additional infero-laterally in early year before assuming a more parallel posture in adult-hood. When the second year of life comes to a close, the ground of the sinus is located a little bit lower than the implantation of the lesser nasal concha. In age of seven, the floor is located at a height about equivalent to the inferior nasal concha, and at the level of the nasal opening floor at 9 years old. In certain instances, the sinus floor may extend more into the hard the palatine recess by moving the palate in a medial direction .

3.13 Balaji Babu Bangiet al (2017)- For forensic identification purposes, the mediolateral, supero-inferior, antero-posterior, and the MSV were measured on computer tomography scans in hundered patients (fifty males and fifty females). The values obtained were subjected to discriminative analysis, and the t-test for separate samples was employed to compare the results in males and females. Conclusions. With a mean accuracy of 88%, the accuracy rate was found to be 84% for men and 92% for women. In conclusion. Our research suggests that, in the absence

of alternative techniques, gender determination can be achieved by CT measurements of the maxillary sinus. The maxillary sinus volume might be included to improve the prediction rate.

3.14 Balaji Babu Bangi et al (2017) - The process of reconstructing the biological profile in forensic medicine is thought to include gender determination as a crucial stage. When other techniques prove inconclusive, the MS can be make use of to determine sex. A great way to look at the MS is with CT. Therefore, the study's goal was to ascertain how accurate gender determination was utilizing CT scans of the MS. Supplies & Procedures. The medio-lateral, superior-inferior, antero-posterior, and MSV were calculated on computed tomography scans in hundred individuals (fifty males and fifty females) in order to ascertain the gender of a person for forensic identify. The obtained results were subjected to biased analysis, and the values of both gender were compared using the *t*-test for differentiate samples. The resports showed that the accuracy rate was 84% for men and 92% for women, with an average accuracy of 88%. In conclusion. Our research suggests that, in the absence of alternative techniques, gender determination can be achieved by CT calculation of the MS. Including the MSV can boost the prediction rate.

3.15 Miguel Velasco-Torres et al (2017) - One calibrated individual assessed a total of three ninety four separate CBCT scans in this cross-sectional investigation. In sequence to calculate the MS's overall volume, the examination the separation in the middle of the medial and the side walls located at five, ten, and fifteen millimetres uphill from the sinus ground, the septa's peak (if any), and the maxillary sinus's peak both the alveolar ridge and the cavity and from the meatus to the sinus floor. The age, gender, and edentulous status of the patient were recorded as dependent variables. Findings: In fully and partially edentulous patients, the total maxillary sinus volume was considerably lower. compared to dentate subjects' patients. This Age had an impact on the findings, as Patients who were older showed smaller volume, irrespective of edentulous and gender standing. There was an inverse relationship in the middle of age and the distance to the meatus. the medilateral measurements, as well as the sinus volume. Furthermore, the the frequency of accessory meatus in 29.19% of this inhabitants was this. Closure: The extent to which factors that impact the maxillary sinus age and the state of edentulous being lessened by tooth loss and age.

3.16 Ranjith Kumar Kanthemet al (2015- The study included thirty patients in all, seventeen men and thirteen women, who were seen in the Mamata General Hospital's outpatient department. The measurements of what is rt. and 30 participants' lt. MS sinus from normal computed tomography scans were assessed using SYNGO statistical analysis and software were completed. Results: Using height to determine a person's sex.The MSV, height, and length on both sides demonstrated statistical noteworthy outcomes in the case of volume with a elevated % of sexual dimorphism. The right MSV can be a reliable diagnostic indicator for determining a person's sex.

3.17 Rev Gauch et al (2014 - The purpose of this study was to evaluate sixty pre-operative CTs in order to quantify the maxillary sinus's extension and linear measures, as well as the exsistence or non-exsistence of sinus diseases and bone septum, in patients aged 35 to 75. Completely edentulous posterior maxillae, either unilaterally or bilaterally, as well as being in a state to undergo bone graft operation with MS elevation and subsequent dental implant adjust, were the inclusion criteria. The computed tomographs were carried out using a low radiation exposure and high resolution Cone Beam Computed Tomography - NewTom 3G(r) (Mod. QR-DVT9000-QRSRL(tm), Verona, Italy). The parameters of the operation were as follows: 110KVp, variable

MAs (based on the individual's size), 1 millimeter thick slices, 36-second accession time, and a 9-inch cone beam opening.

3.18 Reham M. Hamdy et al (2013) - The imaging equipment (i-CAT Imaging, younger generation, ISI, Hatfield, USA) was utilized to obtain the figures. The patients were rendered immobile while exposed in a seated position. adjusting the head opposed to the head rest using a head band and chin cup. It was determined that the mid-sagittal plane was vertical.I.e. With a image cuts of 0.3 millimeter, the operating parameters were 120 kVp and 5 mA. The Goal of the i-CAT ISI software was utilized, allowing the process of capturing images' linear measurements. Observer N A.-W.conducted the measurements and has a fifteen years of experience in maxillofacial and oral radiography. This The Faculty Research Ethics Committee gave its approval to the study. Cairo University's Department of Oral and Dental Medicine.

3.19 Pernilla Sahlstrand-Johnsonet al (2011**) -** In their study - 60 individuals with a difference between mean age of 40 ± 14 years who had head CT scans were included in this retrospective study. Twenty patients each in the following age groups—18–32, 33–49, and 50–65—were assigned ages correspondingly. The maxillary sinus volume was computed at the Siemens AG, Medical Solutions, Erlangen, Germany Leonardo work station using the capacity application.. Male patients' mean values for the volume, cranio-caudal diameter, and antero-posterior diameter of the frontal sinus, as well as the correlate with values for female patients, were significantly higher. In the right sided MS , On average, the automatically computed volume exceeded the calculated value by 14–17%. This piece made the argument that reader opinion about the slice may have contributed to selection bias.

3.20 Y. Ariji et al (1995) - The axial slice of CT was used to assess the patients' sinuses horizontal and antero-posterior diameters, and the connection between these measurements and the volume of sinus was examined. The upright distance from the front nasal spine to the sinus ground was calculated in favor to determine the peak of the sinus ground. On axial CT, the maxillary sinus's horizontal and antero-posterior thickness serve as useful markers of its size. Changes in volume of sinus caused the peak of the sinus ground to shift, but the state of the dentition had no direct impact.

3.21Y. Ariji et al (1993) - The 5000 patients that the Department of Oral and Maxillofacial Radiology at Kyushu University Dental Hospital investigated for maxillofacial infections between 1985 and 1992 provided the CT images used in this investigation. The maxillary sinuses were scanned in both of the images, and the sinuses were found to be asymptomatic and distinct from any disease, such as a tumor or fracture, while choosing the images. A strong association (r = 0.95) was seen correlation with the volume of right and left sinus. The right and left side mean volume did not differ significantly. At 10.2 ± 9.1%, the degree of symmetry was observed, and the mean dissimilarity between the right and left sides was 1.49± 1.40 crrr". Not a single one of these measures showed a significant sex difference. Limitations: There will be a decrease in volume due to tooth loss. The teeth that are attached to the maxillary sinus are the first premolar through the third molar. the CT scan and panoramic x-rays' indication of the presence or absence of each of these five teeth on either side.

3.22 Eleni Panouaet al (2024 – Bimaxillary orthographic surgery was necessary for 17 Class 3rd skeletal sick person six men and eleven women who needed to be chosen. CBCT scans were utilized for volumetric assessments both preoperatively and 3.9 6 0.87 months thereafter. following surgery. MIMICS 14.0 software was used to evaluate and interpret each CBCT scan. The pharyngeal airway and maxillary sinus volumes prior to and following surgery, as well as

the amounts of jaw movement during surgery and the formentioned volumes were statistically assessed. Male pharyngeal airway volumes, both lower and total, decreased substantially (4196.27 6 2061.11 mm3 and 3375.53 6 3624.67 mm3)., although the pharyngeal airway area did not show any significant changes. correspondingly). There was no discernible shift in the pharyngeal airway's minimum cross-sectional area. There was a notable decline in the following surgery, the maxillary sinus volume increased by 3448.09 6 3315.56 mm3. There was no relationship found. discovered between the degree of skeletal mobility and the variation in the pharyngeal nuses in the maxilla or airway. Males showed a significant lessen in the capacity of the maxillary sinuses as well as a significant decrease in the lower and total pharyngeal airway sizes.

3.23 Amaya Iturralde-Garroteet al (2023) - According to PRISMA 2020 guidelines, this review was conducted. In June and July of 2022, a thorough modern technology search was carried out across 5 data-bases. Research that evaluated the Age-related volumetric changes in the paranasal sinuses qualified for inclusion. An analysis of the quality of the listed studies' methodology and findings was carried out. Evaluation of quality was conducted with the NIH quality evaluation instrument. The qualitative synthesis contained 38 studies in all. The majority of writers that examined the maxillary and ethmoidal sinuses came to the conclusion that they develop from birth until they reach their maximal growth peak, at which point they start to decline in volume with aging. Findings of the volumetric variations in the FS and SS. There are mixed sinuses. Assumption: Drawing on the findings of the research that are part of this review, it may be drawn that as people age, their maxillary and ethmoidal sinus volumes seem to diminish. Concluding remarks regarding the volumetric alterations in the frontal and sphenoidal sinuses require additional information..

3.24 Jyotsna Kitchluet al (2022) - 118 participants in the study were split into 3 groups of age decided on morphometric investigation of their MS CT scans: those in the 20–30 age groups, those in the 31–40 age groups, and those in the 41–50 age groups. Both the left & right sides of the maxillary sinuses were measured. maxillary sinus. Following measurement, the maximum sinus's cc diameter, axial diameter, antero-posterior diameter, and volume were statistically examined. evaluation to ascertain the t-value, p-value, and mean difference for assessment. The mean measurements of the both MS, as well as their breadth, depth, and volume, showed a statistically significant correlation in the 20–30 years and 31–40 years group of age. Throughout our research It was shown that when people aged past 40, there was a decline in The size of the MS and our further results were in line with the earlier review. Finally, the investigation was critical in identifying age since CT scans provide important information about the maxilla sinus dimensions in various ages. When planning procedures, it was essential for doctors and surgeons.

3.25 Rubira-Bullen et al (2010) - There were 158 postero-anterior face radiographs (Caldwell projection) in the sample. Using guidelines and a viewing box, the peak and breadth of the FS on bilateral sides were calculated in accordance with a conventional procedure. The connection between frontal sinus dimensions and size, age, and the side of the face were assessed. Findings: Six of the thirteen radiographs were u/l. FS, two aging individuals, and 5 displaying fully distinct apartment). The last patient under investigation consisted of 145 participants. The average values found were 39 mm for the superoinferior distance and 68 mm for the latero-lateral distance. 39.3% of the cases had the left apartment being higher than the right, or the two sides being roughly equal.TheSpearman coefficient showed a significant link between the breadth and peak of the FS, however the Kruskal Wallis test disclose that no noteworthy dissimilarity across the age groups under investigation ($p > 0.05$). In summary, there is a This

population has a wide anatomical diversity in frontal sinuses. The frontal sinus's left cavity is bigger or equivalent to the correct one, and there were no discernible age group variations in terms of frontal sinus size.

3.26 Mohammad Ahmad Abdalla et al (2022) **-** The following claims and terms were searched for in the following places: the title, keyword, Human maxillary abstract, introduction, and article heading: sinus, developing maxillary sinus, maxillary sinus architecture, pneumatization, innervations of maxillary maxillary sinus, sinus blood supply, and maximum sinus functions or concepts based on functions. Boolean (or, and/or not) search strategy was used. Original research articles, case studies, and other scientific publications that are available to everyone, as well as meta-analyses, thorough reviews, and the referenced works of Up until October 2021, these items were investigated and evaluated once more. There don't seem to be any issues with this research that need to be brought up. To sum up, the anatomical complexity covered in the most recent articles is exemplified by the physiology and functioning of the maxillary sinus. This implies that everything it does might be a part of a bigger, more intricate picture than what is readily apparent at the moment.

3.27 Phrabiiakaran nambiar,I et al (1999) **-** The majority of anatomical research indicates that these sinuses lighten the skull and give the voice more resonance, while their exact roles are yet unknown. Around the fourth month of pregnancy, once the frontal recess develops, the frontal sinuses form as diverticulitis from the lateral nasal wall. They can also emerge from the frontal furrow, anterior region of the frontal recess, or the laterally positioned anterior ethmoidal cells. The report's male victim passed away in an air crash where his bodyas badh-burned, making it urgently necessary for police and forensic doctors to identify him and the other victims.

3.28 Michael J. et al (2020) **-** The inclusion of the investigation was based on 591 consecutive CT scans of the maxillofacial and sinus regions. Following the exclusion of patients with respiratory illnesses or inflammatory sinusitis, three twenty three computed tomography scans were evaluated using the evaluation of Pneumatisation of the PNS tool, and pertinent population analysis information was noted for every scan. The application results were contrasted in accordance with laterality and demographic traits. Different paranasal sinus pneumatisation patterns were found in a population without disease based on laterality and sex. Men (10.16) were more comprehensive pneumatised than women (9.18, P=0.005), and the LT. side (4.95) was more pneumatised than the RT. (4.74, P=0.006), according to the APPS score. An association between age and sinus pneumatisation was not seen (ρ=0.025). The likelihood 69% of a particular person's paranasal sinus pneumatisation had detectable asymmetry, and the likelihood of left-sided 53% of the population was dominant. Conclusion: Even in individuals without sinus disease, there is a significant anatomic variance in the structure of the paranasal sinuses. There are notable distinctions in the middle of the bilateral sides as well as between males and girls. Sustained methodical investigation into the anatomy of the paranasal sinuses could lead to the development of a standard for CT sinus assessment, which would help doctors analyze anatomic variation and make surgical decisions.

3.29 Y. Kakimoto a et al (2023**) -** 52 cases of drowning and 59 cases of non-drowning were assessed. A computed tomography (CT) scan was used to assess the MS fluid capacity, and manual measurements of the lung weight and pleural effusion volume were made during the autopsy. These three indices' usefulness in identifying drowning and its Postmortem modifications were assessed. In drowning patients, the maxillary sinus fluid volume was much greater than in cases of other external causes and cardiovascular mortality. An analysis of the

receiver operating characteristic curve revealed that a total maxillary sinus fluid volume >1.04 mL (odds ratio, 8.19,2.29) was a more reliable indicator of drowning than a total lung weight >829 g and a total pleural effusion volume >175 mL (odds ratio, 7.23). The combined pleural effusion volume and maxillary sinus fluid content, when compared to either indication alone, predicted drowning more well. Moreover, the maxillary sinus fluid volume was less affected by the postmortem delay up to one week after death than the other two indices were. With greater sensitivity and an odds ratio, maximal sinus fluid volume can be a more helpful diagnostic tool for drowning than lung weight and pleural effusion volume.Practice-related implications: The buildup of fluid in both maxillary sinuses is a strong indicator of drowning in the images taken after death.

3.30 Konstantinos Natsis et al (2018**) -** Age groups of 20–39, 40–59, and 60 years and older were used to categorize ninety-seven European adult dry skulls (59 males and 38 females). The direct separation in the middle of the optic fora-men and a marking in each orbital unit was used to calculate the length of each Or rim. Asymmetry toward one side could be seen in the lengths of the inferior, superior, and medial bones. Although a gender dimorphism was seen, there was no correlation with age. A right formula and a left formula with a coefficient of determination of R2 for the left OrF (0.43 and 0.57, respectively) were developed utilizing the Stepwise Multiple Regression Analysis. Without specialized material, the proposed formulas provide an exact, simple, and customizable method to calculate the linear length of the Or in cases when the IOR and OrF have been completely destroyed. These findings may improve the planning of challenging orbital reconstructions and procedures for orbital floor fractures.

CHAPTER-4

METHODOLOGY

4.1 Study-Design

This is Retrospective study

4.2 Sample size

284 Subjects were recorded for this study.

Inclusion Criteria

1. Patients with complaints of headache, vertigo.
2. Patients of age group 18 to 68 years of Age.

Exclusion Criteria

1. Individuals who have mid-facial injuries were not accepted.
2. Unwilling Participants.
3. patients with tumors, mucocele, or signs of prior sinus surgery

4.3Data Collection

A MSCT scanner (Siemens 16 Slice) was used to evaluate each subject.. With a 1.0 mm slice collimation, images were acquired. For analysis in the Picture Archive and Communication System (PACS, SECTRA), transverse and coronal pictures with image thicknesses of 0.6 and 0.6 mm, respectively, were created using the skeleton algorithm and skeletal window (window center 800 and window width 2600). A radio-technologist carried out the subsequent measurements on their own with the help of radiologist.

Maxillary sinuses: (a) max cranio-caudal measurement; (b) max depth (antero-posterior measurement); (c) max breadth; (d) the peak on the axial slices in the center of the maxillary sinus; and (e) the wideness of the canine fossa, the bone anterior-wall. The latter was calculation 1.5 centimeter below the canine fossa's suggest placements, or margo infraorbitalis. While the remaining calculation were made on axial images, calculation (a) was done on coronal slices.
On the transverse pictures at the same level as (1e), the widthness of soft-tissue in the middle of the skin surface and the anterior wall of the MS at the canine fossa was assessed.

Frontal sinuses: axial pictures at the orbital roof level were used to measure the anterior wall's thickness and maximum depth (anteroposterior diameter).

The orbital floor's thickness was assessed on the solar pictures. The procedure for carrying out the aforementioned measurements is depicted in Figure 5.1
Every measurement's provided value was the average of radio-technologist readings. Additionally, the maxillary sinuses' volume was calculated using the volume application at the Santosh deemed university Ghaziabad
An automated determination of the capacity of each MS for each subject in the research was made possible by the measurement of the depletion of the free space in the Ms. The free space in the MS was depletion within the range of 200 to -1200 House field unit. The average depletion value of the maxillary sinuses' gas was measured at MIN -1023.0HU.

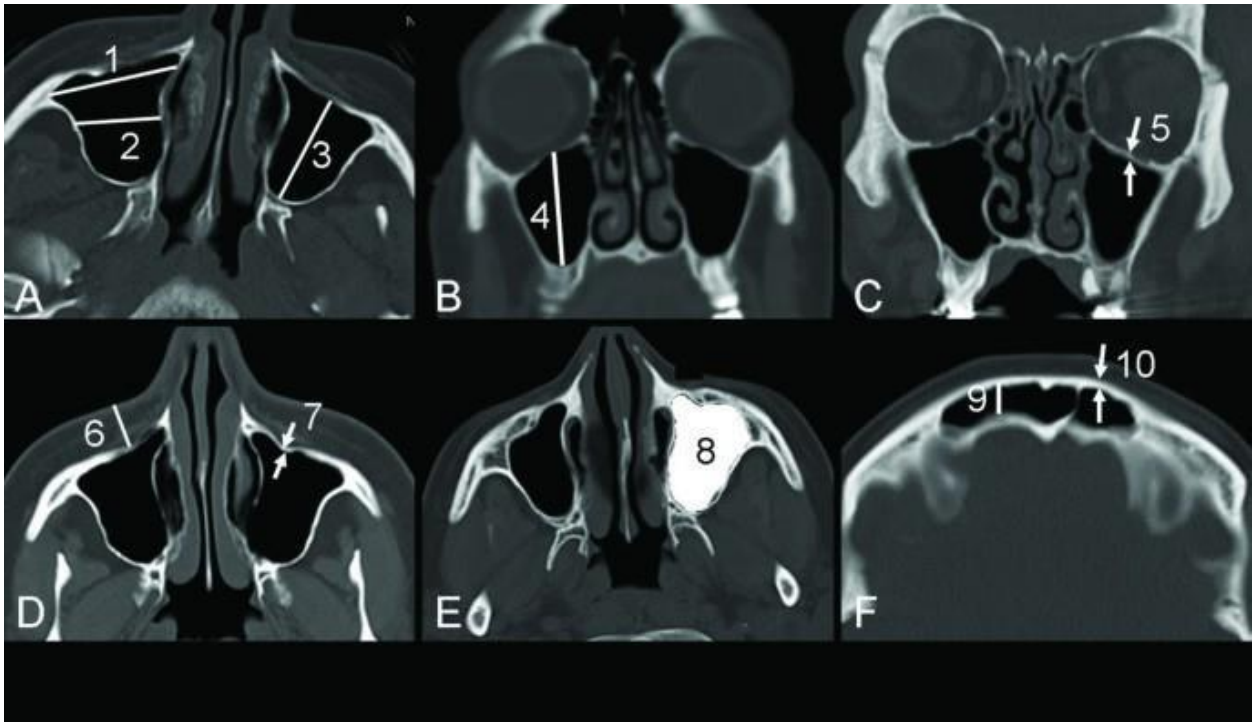


Figure 4.1 (A, D-F) axial CT scans and Figure 1 (B-C) coronal CT scans illustrate how various dimensions are measured: (1) MS maximal width; (2) MS width at midline; (3) MS maximal depth (antero-posterior diameter); (4) maxillary sinus maximal height; (5) thickness of the orbital floor; and (6) thickness of soft tissue between the anterior and posterior the thickness of the anterior wall of the maxillary sinus (canine fossa) and the skin surface, (7) the maxillary sinus at the canine fossa, and (8) the volume that was automatically calculation.(9) One centimeter lateral to the midline, at the level of the orbital roof, were used to measure the frontal sinus's depth and the thickness of its anterior wall, respectively. Every measurement was taken using skeleton settings on the photos.

The following formula was used to determine the capacity of each Ms when its 3D were measured: (Width × anteroposterior × craniocaudal diameter × 0.5). The breadth The axial slices' mean values for the maximum thickness and the thickness at the sinus's midpoint (measurements 1 and 2 in figure 5.1) were utilized in this computation.

CHAPTER-5

RESULTS

5.1Statistical analysis

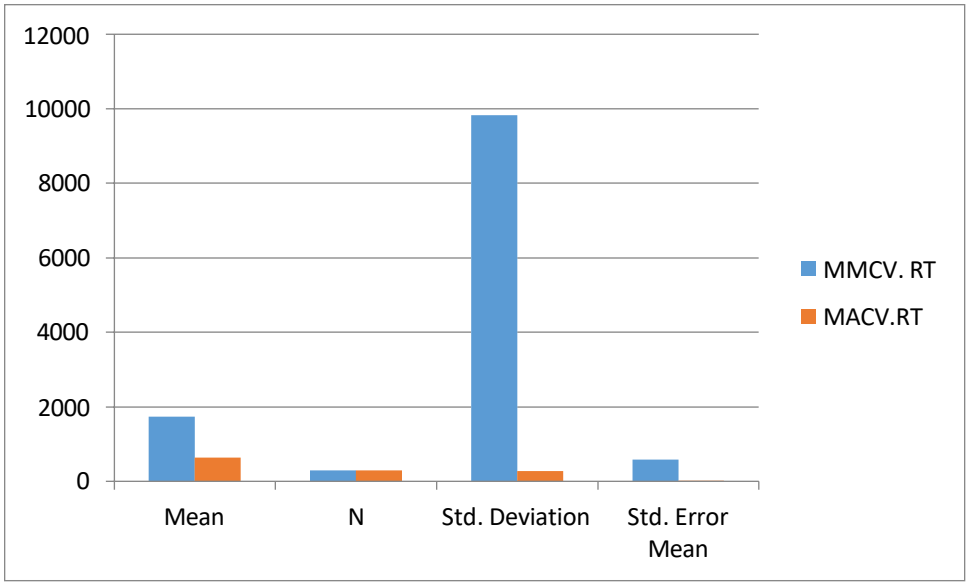
With SPSS 17, statistical analysis was carried out. The data is displayed as standard deviations (SD), mean with 95% confidence interval (95% CI), or proportions (%). An examination of the interobserver agreement's reliability regarding the various measures that were conducted was accomplished by: computing a two-way mixed model for coefficient of intra-class co-relation and two groups differentiation with t-test. P values less than 0.05 were regarded as statistically noteworthy differences.

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	MMCV. RT	1734.794	284	9818.7432	582.6352
	MACV.RT	638.726	284	272.0123	16.1410

Table 1. Shows the difference between manually and automated calculated volume in right maxillary sinus.

The paired sample statistics for the two sets of variables on the RT and LT sides are displayed in this table. Data for both sides are provided, and the pairs being compared are MMCV (perhaps Mean Motor Conduction Velocity) and MACV (maybe Mean Amplitude Conduction Velocity). The table can be interpreted as follows:Mean: The mean MMCV and MACV values for the both sides. For instance, the mean of MMCV (RT) is significantly higher than that of MACV (RT)(638.726).N: The sample size, which is 284 for each variable based on the number of observations.



Graph 1. Shows the difference between manually and automated calculated volume in right maxillary sinus.

This graph indicated that the difference between pair 1 that is manually calculated volume and automated calculated volume is non-significant.This is how the MMCV.RT - MACV.RT **Interpretation**-The p-value is 0.060, it is marginally greater than the 0.05 traditional significance level. This indicates that the difference between MMCV.RT and MACV.RT is not statistically significant, but it is almost.

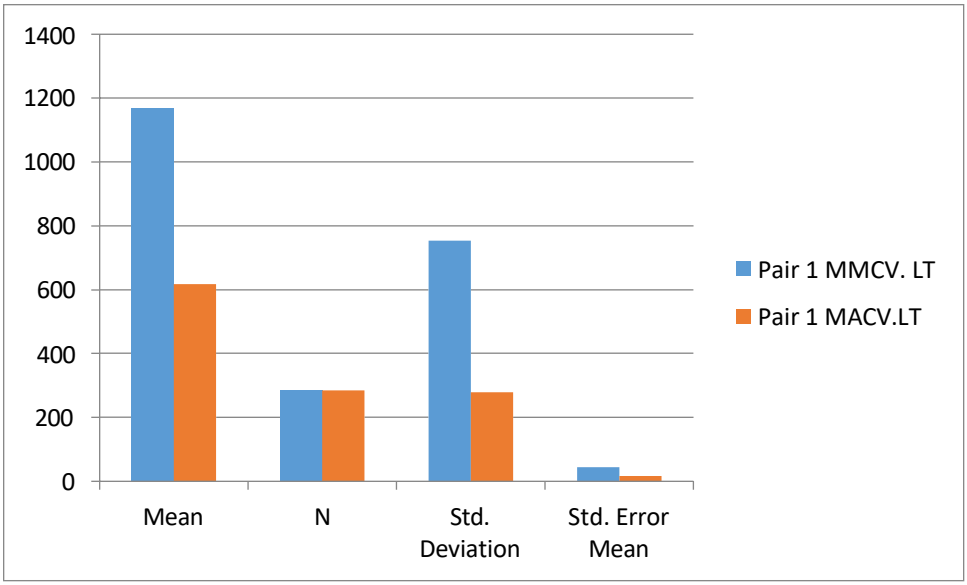
Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	MMCV. LT	1168.307	284	754.5279	44.7730
	MACV.LT	616.498	284	279.0451	16.5583

Table 2.Shows the difference between manually and automated calculated volume in left maxillary sinus.

According to this graph between MMCV.LT - MACV.LT's,

Findings from the Paired Samples Test: The standard deviation is 585.8596. 34.7644 is the standard error of the mean. 95% Confidence Interval for Differentiations: Reduced: 483.3796 T-value: 1.873; upper bound: 620.2387.283 DF (degrees of freedom) Significant difference (two-tailed): 0.000 ($p < 0.05$).



Graph 2.Shows the difference between manually and automated calculated volume in left maxillary sinus.

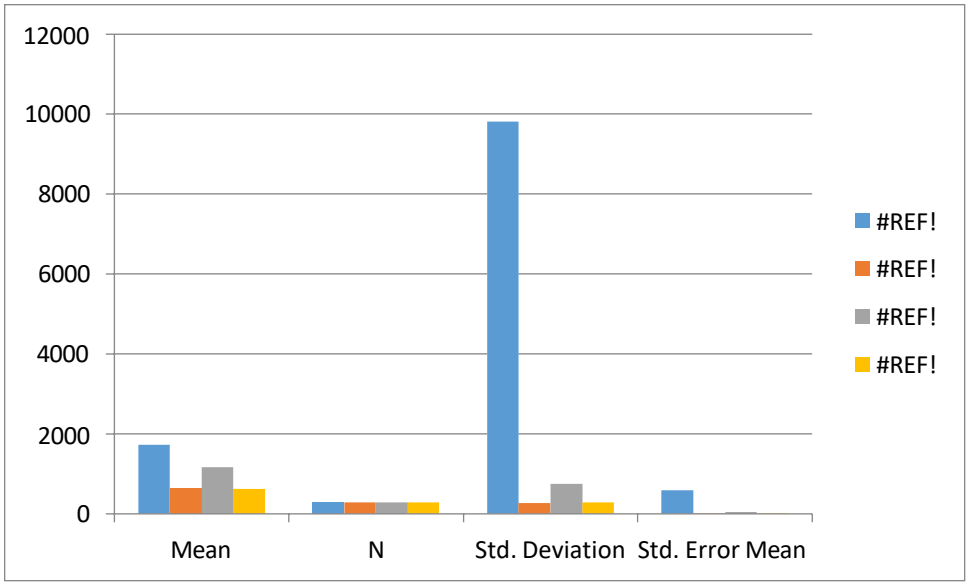
Interpretation: This graph shows statistical significance of the difference between MMCV.LT and MACV.LT is indicated by the p-value, which is 0.000. The noteworthy distinction is further supported by the 95% confidence interval not crossing zero.

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	MMCV. RT	1734.794	284	9818.7432	582.6352
	MACV.RT	638.726	284	272.0123	16.141
Pair 1	MMCV. LT	1168.307	284	754.5279	44.773
	MACV.LT	616.498	284	279.0451	16.5583

Table 3. Shows difference between manually and automated calculated volume of both sinuses.

Graph shows descriptive information for paired samples, specifically comparing reaction times (RT) between MMCV and MACV for the right (RT) and left (LT) sides, appear to be included in the table you gave. The figures are broken down as follows: Mean: The average value of the reaction times for each condition: The total number of paired observations (always 284. The standard deviation shows how widely distributed the results are from the mean. Normal Error Mean: An approximation of how far the sample means differ from the population mean. Table breakdown: Pair 1 (Right Side Reaction Time) MMCV. RT: Standard Deviation = 9818.7432, Standard Error = 1734.794 582.6352 MACV is the mean. RT: Mean = 638.726, Std. Deviation = 272.0123, Std. Error Mean = 16.141.



Graph 3. Shows difference between manually and automated calculated volume of both sinuses.

Here are the results of the Paired Samples Tests for Pairs 1 and 2, respectively, MMCV.RT - MACV.RT and MMCV.LT - MACV.LT:

Meaning for the First Pair: The difference between MMCV.RT and MACV.RT is relatively close, but the p-value of 0.060 indicates that it is not statistically significant, as it is slightly above the standard significance level of 0.05.

Analysis of Pair 2:With a confidence interval that does not overlap zero, the p-value of 0.000 denotes a statistically significant difference between MMCV.LT and MACV.LT. This indicates that there is a noteworthy distinction between the two variables.

In conclusion, there is no discernible difference between MMCV.RT and MACV.RT (p = 0.060).Significant difference (p = 0.000) between MMCV.LT and MACV.LT

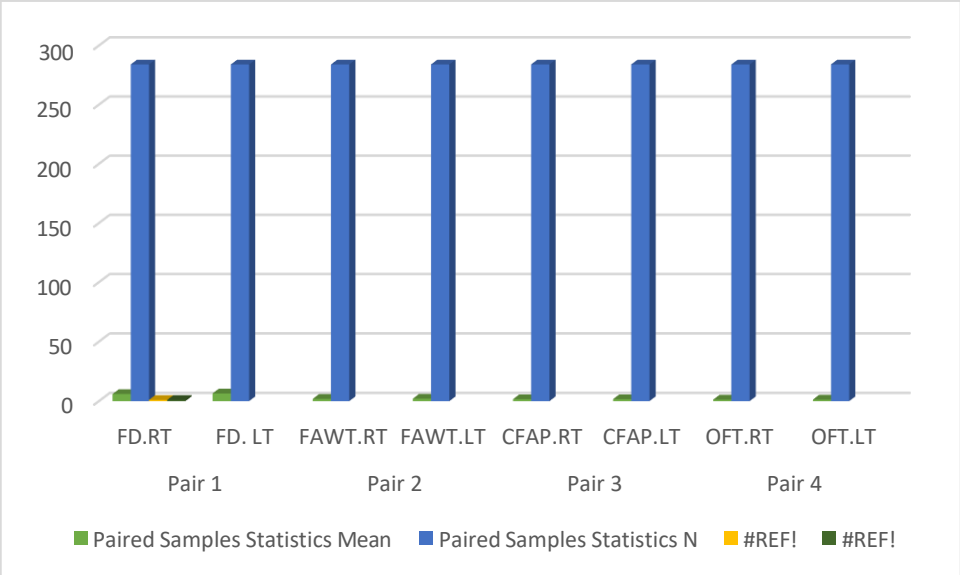
Paired Samples Statistics					
		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	FD.RT	6.002	284	4.4425	0.2636
	FD. LT	6.484	284	4.4783	0.2657
Pair 2	FAWT.RT	1.941	284	1.4449	0.0857
	FAWT.LT	2.108	284	1.5927	0.0945
Pair 3	CFAP.RT	1.652	284	0.4878	0.0289
	CFAP.LT	1.668	284	0.5376	0.0319
Pair 4	OFT.RT	1.323	284	0.3372	0.02
	OFT.LT	1.323	284	0.3636	0.0216

Table 4. Shows measurement difference between frontal sinus depth, anterior wall thickness, canine fossa ap, and orbital floor thickness.

Frontal depth on the left and right sides of Pair 1.RT: average = 6.002, standard deviation = 4.4425, N = 284. 0.2636 FD is the error mean. Average = 6.484, Standard Deviation = 4.4783, Standard Error = 284. Error Mean: 0.2657Pair 2: Left and right frontal anterior wall thickness FAWT.RT: N = 284, Mean = 1.941, Standard Deviation = 1.4449, Std. 0.0857 FAWT is the error mean. Mean: 2.108, N: 284; Standard Deviation: 1.5927; Std. Error Mean: 0.0945 Pair 3: left and right canine fossa, anterior-posteriorCFAT.RT: average = 1.652, standard deviation = 0.4878, standard deviation = 284. Error Mean = 0.0289 CFAP.LT: Mean = 1.668, N = 284, Std. Deviation = 0.5376, Std. Mean Error: 0.0319. Pair 4: left and right lateral floor thickness (OFT). RT: Standard Deviation = 0.3372, Standard Mean = 1.323, N = 284, Stat. Mean Error: 0.02. OFT.LT: N = 284, Mean = 1.323, Std. Standard deviation is 0.3636. Mean Error = 0.0216

Overall Conclusions:

The mean reaction times for the left-hand (LT) replies are either somewhat faster or very nearly so compared to the right-hand (RT) responses in every pair.The standard deviations are reasonably close within each pair, suggesting that the variance of the right-hand and left-hand responses for each metric is not significantly different.The sample means appear to be a reliable representation of the population mean, as indicated by the comparatively modest Standard Error Mean (SEM).



Graph4. Shows measurement difference between frontal sinus depth, anterior wall thickness, canine fossa ap, and orbital floor thickness.

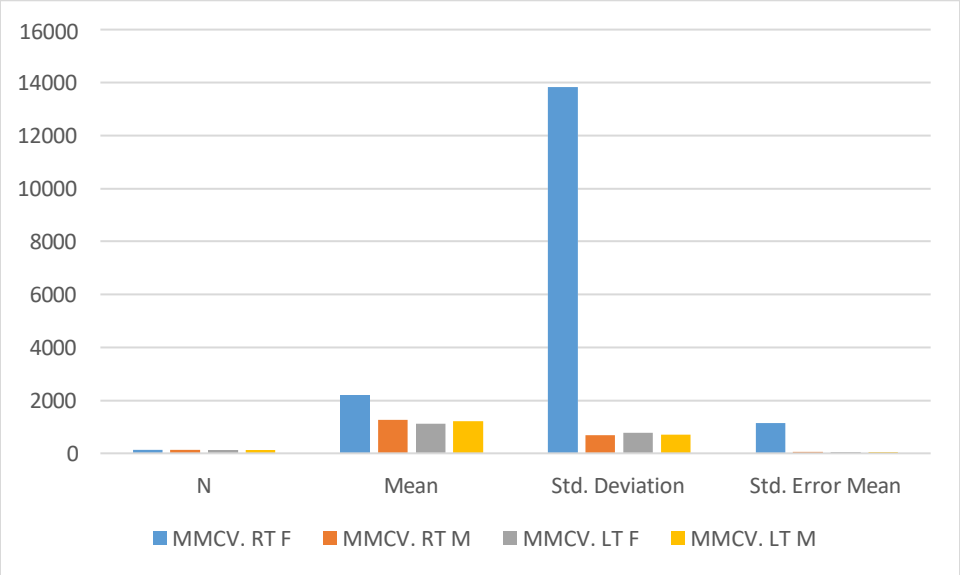
According to the graph for every pair, these are the outcomes of the Paired Samples Test: Understanding for the First Pair: FD.RT and FD.LT differ statistically significantly, as shown by the p-value of 0.011, which is less than 0.05. FD.RT appears to be lower than FD.LT based on the negative mean difference. For every pair, these are the outcomes of the Paired Samples Test: Understanding for the First Pair: FD.RT and FD.LT differ statistically significantly, as shown by the p-value of 0.011, which is less than 0.05. FD.RT appears to be lower than FD.LT based on the negative mean difference.In Pair 2, the p-value is 0.054, which is somewhat above the 0.05 cut-off and suggests that there isn't a statistically significant difference, albeit being close, between FAWT.RT and FAWT.LT.Pair 3 interpretation: We find that there is no statistically noteworthy dissimilarity in the middle of CFAP.RT and CFAP.LT, with a p-value of 0.594—much higher than 0.05.Pair 4 Interpretation: The p-value of 1.000 indicates that there is no difference between OFT.RT and OFT.LT, since the mean difference is precisely zero

Group Statistics

	Sex_New	N	Mean	Std. Deviation	Std. Error Mean
MMCV.RT	F	143	2192.677	13828.836	1156.4254
	M	141	1270.416	693.7691	58.4259
MMCV.LT	F	143	1123.992	790.869	66.1358
	M	141	1213.25	715.8036	60.2815

Table 5. Difference between gender in manually calculated volume of maxillary sinuses.

Right Side (MMCV. RT): Females (F) show a substantially greater standard deviation and a significantly higher mean right side (2192.677) than males (1270.416), indicating a wider range of reaction times for females. Left Side (MMCV. LT): Men had a little faster reaction time on the left side, while females' mean right side is closer to males' mean right side (1123.992). Additionally, the left and right standard deviations are more similar than the right.



Graph5. Difference between gender in manually calculated volume of maxillary sinuses

This is the MMCV.RT and MMCV.LT Independent Samples Test summary **MMCV RT**. Levene's Test for Variance Equality:F: 2.456 Sig.: 0.118 (equal variances assumed, p > 0.05) T-test for Mean Equality: Assumed equal variances: Sig. (2-tailed): 0.43 (p > 0.05, not statistically significant); t: 0.791 df: 282 Standard Error Difference: 1166.071; Mean Difference: 922.2613. 95% Confidence Interval: -1373.0468 is lower. Upper: 3217.5694 It is not assumed that variances are equal. Sig. (2-tailed): 0.427 (p > 0.05, not statistically significant); t: 0.796 df: 142.725. The standard deviation is 922.2613. Difference in Error: 1157.9004. 95% Confidence Interval: Upper: 3211.1116, Lower: -1366.5889

MMCV.LT: The Equality of Variances Test by Levene If equal variances are assumed, F: 2.199 Sig.: 0.139 (p > 0.05). Mean equality test (T-test):presumptive equal variances Two-tailed significance level (p > 0.05, not statistically significant); t = -0.997 df = 282. The deviation from the mean is -89.258. 89.5492 is the difference in error. Interval of 95% Lower Confidence: 265.5278 Up: 87.0117. Variance equality is not assumed. Not statistically significant (p > 0.05), with a 2-tailed significance value of 0.319. Df = 279.962; t = -0.997 .The deviation from the mean is -89.258. 89.4863 is the difference in error. 86.8935, or 95% Confidence Interval Upper: -265.4096 Lower:

In summary, the p-values of MMCV.RT and MMCV.LT indicate that there is no statistically noteworthy dissimilarity in the middle of the groups. (p> 0.05).With regard to the assessment of the cranio-caudal measurement of Ms, the depth of the front wall of the frontal lobes, and the sinuses significant in determining the maxillary sinuses' thickness and anteroposterior diameter within the fossa. The consensus between observers during the measuring the maxillary sinuses'

anterior wall and With interobserver, the orbital floor was medium variance in measuring for random error of between 0.3 and 0.5 millimeters in size, these structures.The degree of agreement between the volume of Ms measured automatically and the capacity determined using the formula width × anterior × cranio-caudal diameter × 0.5 was nearly flawless. In addition, the sinus volume is often underestimated when mucosal thickness and other sinusopathies are present when employing such approaches for sinus volume measurement.The P values of previous study is 0.07 and 0.11, respectively, indicate that there were no statistically noteworthy variations in the volume of the both maxillary sinuses in the male or female groups.Although this study shows slightly differentiation between right and left manual calculated volume but no statisticallysignificant between male and also.

DISCUSSION

Male maxillary sinuses are larger and wider than those of females, according to a prior study, but this study refuted that finding by demonstrating that there are no appreciable gender dissimilarity. The sinus volume of males and females is similar. We identified a substantial age difference between the both MS volumes in our experiment, which only included adults (age 18–68). According to Pernilla Sahlstrand-Johnsonstudies, losing teeth and aging both cause an increase in the maxillary sinus volume. Canine fossa AP diameter shows similar in most study but we studies that both canine fossa ap diameter, anterior wall thickness, orbital floor measurements are almost similar, there are no statistically significant. The anatomy, size, and dimensions of the maxillary sinuses undergo significant modifications after birth. As such, it is important to take into account the potential magnitude of variations in the capacity at the necessary surgical procedure. Given that maxillary hypoplasia is so influencing the maxillary sinus's dimensions. Research findings had indicated that both sexes have smaller maxillary sinuses following attaining the highest possible degree of growth, this might be because of loss of minerals in the bone matrix around the maxillary sinuses the maxillary sinus's bone wall decreases as a result, lowering the the sinuses' dimensions. Study shows when age increased sinus volume decreased. The study's findings, which indicate that gender has no bearing on maxillary sinus size, are at odds with earlier data. The maxillary sinus size cannot be used to determine a person's gender, according to the results that have been gathered thus far. These suggest that the development of the sinuses aeration pattern may be similar in some Sudanese persons, affecting the maxillary bones in both sexes. Nonetheless, the results of the current study corroborated those of earlier research that found a minor variation in the volume of the maxillary sinuses on both sides but no statistically significant difference between the sexes. In previous study Left and right In 2.1% and 1.8% of patients, frontal sinus aplasia was found. correspondingly. Regarding the impact of sex, the left unilateral ($p<0.01$) and In females, the bilateral hypoplasia was substantially higher ($p<0.05$). But in this study the value of right maxillary sinus $p>05$. and left almost significant $p<05$[2]. The maxillary sinus volume is decreased as a result of the MMA surgery. There may be a relationship between the maxilla's forward motion and the size of the MS volume decrease.In the clinical context, the baseline frontal sinus category frequency data given in this study is useful for diagnosing sinusitis. Previous research suggests that, in the absence of alternative techniques, gender determination can be achieved by CT measurements of the maxillary sinus. The maxillary sinus volume might be included to improve the prediction rate, similarly in this study proved that gender determination also can be achieved by CT measurements of the maxillary sinus techniques. The maxillary sinus volume might be included to prove gender determination.According to previous study there will be a decrease in volume due to tooth loss. The first premolar to the third molar are the teeth connected to the maxillary sinus. The existence or lack of each of these five teeth on either side as shown by the CT scan and panoramic x-rays on based of this study we proved it if age is increased than maxillary sinus volume decreased. .

CONCLUSION

The results of this investigation demonstrated the validity of using CT to quantify the various frontal and maxillary sinus dimensions. Canine fossa, which has not yet been investigated or documented to our understanding. In our opinion, these data are required to advance the creation of a therapeutically useful. Furthermore, we demonstrated a strong association between the both manually and automatically through an expected maximum volume sinuses. In conclusion, we have discussed incidental discovery of something significant in the PNS Sinuses when using CT scans to investigate individuals who may have rhino sinusitis with other illnesses.

CHAPTER-10

BIBLIOGRAPHY

1. Pernilla Sahlstrand-Johnson, Magnus Jannert, Anita Strömbeck, and Kasim Abul-Kasim.Computed tomography measurements of different dimensions of maxillary and frontal sinuses2011 Apr. doi: 10.1186/1471-2342-11-8.

2. Abdalla Ahmed Elamin,Tolgahan Acar, Samih Kajoak, Saadeldin Ahmed Idris, Bushra Abdel Malik, Caroline E Ayad. Volumetric Measurement of the Maxillary Sinuses in Normal Sudanese using Computed Tomography: A Retrospective Study. 2021 may. DOI: 10.7860/JCDR/2021

3. Y Ariji, E Ariji, K Yoshiuraand S Kanda. Computed tomographic indices for maxillary sinus size in comparison with the sinus volume.JAN 2014https://doi.org/10.1259/dmfr.25.1.9084281

4. Ariji Y, Kuroki T, Moriguchi S, Ariji E, Kanda S. Age changes in the volume of the human maxillary sinus: a study using computed tomography. 1994 augDOI: 10.1259/dmfr.23.3.7835518

5. ErliSarilita , YurikaAmbarLita , Harry GaluhNugraha , NaniMurniati , HarmasYazid Yusuf Volumetric growth analysis of maxillary sinus using computed tomography scan segmentation: a pilot study of Indonesian population 2021 Dec.doi: 10.5115/acb.21.051.

6. Balaji BabuBangi, Uday Ginjupally, Lakshmi Kavitha Nadendla, and Bhavana Vadla.3D Evaluation of Maxillary Sinus Using Computed Tomography: A Sexual Dimorphic Study Volume 2017. https://doi.org/10.1155/2017/9017078

7. Rev Gaúch. Odontol.Relative area measurement of maxillary sinus by computed tomographyJun 2014. https://doi.org/10.1590/1981-86372014000200012556

8. IA Cunningham, PF Judy Computed tomography - The biomedical engineering handbook, 2000.

9. Euclid SeeramComputed Tomography - E-Book (3rd ed.)Computed Tomography - E-Book

10. M. Gulec1, M. Tassoker1, G. Magat1, B. Lale2, S. Ozcan1, K. Orhan3, 4Three-dimensional volumetric analysis of the maxillary sinus: a cone-beam computed tomography study September 2019.

11. Reham M. Hamdy, Nagla'a Abdel-Wahed Three-dimensional linear and volumetric analysis of maxillary sinus pneumatization. June 2013

12. Asma Sulaiman Al Hatmi, Eiman Al Ajmi, Halima Albalushi,Meetham Al Lawati. Srinivasa Rao Sirasanagandla. Anatomical variations of the frontal sinus: A computed tomography-based study. https://doi.org/10.12688/f1000research.129498.2

13. Lisa Köhler1, Ellen Schulz-Kornas, Ingrid Vervuert, Claudia Gittel, Karsten Winter, Dagmar Berner and Kerstin Gerlach. Volumetric measurements of paranasalsinuses and examination of sinonasalcommunication in healthy Shetland ponies:anatomical and morphometriccharacteristics using computedtomographyhttps://doi.org/10.1186/s12917-021-02748-6

14. Chathula Wickramasinghe1, Amal Nishantha Vadysinghe1,Sarathchandra Kodikara1 and Jeevani Udupihilla. Frontal sinus pattern analysis for human identification using non-contrast computed tomography images: A Sri Lankan experience 2022DOI: 10.1177/20503121221143628

15. Mario Pe´rezSaya´ns, Juan A. Sua´rez Quintanilla, Cintia M. Chamorro Petronacci,Jose´ M. Sua´rez Peñaranda, Pı´aLo´pez Jornet, Francisco Go´mezGarcı´a,Yolanda Guerrero Sa´nchez.Volumetric study of the maxillary sinus in patients with sinus pathology. https://doi.org/10.1371/journal.pone.0234915Published:June 18, 2020

16. Camila S. Dassi Flávia R. Demarco João Mangussi-Gomes Raimar Weber Leonardo BalsalobreAldo C. Stamm. The Frontal Sinus and Frontal Recess:Anatomical, Radiological and Surgical Concepts. jul 2020. doi: 10.1055/s-0040-1713923

17. Andrew Whyte and ,RudolfBoeddinghal. The maxillary sinus: physiology, development andimaging anatomy 2019. birpublications.org/dmfr

18. Ranjith Kumar Kanthem,Venkateswara RaoGuttikonda,SivaranjaniYeluri,Geetha Kumari Sex determination using maxillary sinus. May 2015. doi: 10.4103/0975-1475.154595

19. Balaji Babu Bangi, Uday Ginjupally, Lakshmi Kavitha Nadendla, and Bhavana Vadla 3D Evaluation of Maxillary Sinus Using Computed Tomography:A Sexual Dimorphic StudyVolume 2017, https://doi.org/10.1155/2017/9017078.

20. Joe Iwanaga1,2,3, Charlotte Wilson1 , Stefan Lachkar1 , Krzysztof A. Tomaszewski4 , Jerzy A. Walocha5 , R. Shane Tubbs1,6Clinical anatomy of the maxillary sinus: application to sinus floor augmentationSeptember 18, 2018. doi: 10.5115/acb.2019.52.1.17

21. Paweł Piotr Grab 1,* , Michał Szałwi ´nski 1 ,Changes in Maxillary Sinus Volume and Mucosal Thickness Post Bimaxillary Advancement Procedures: A Retrospective Study 2024, https:// doi.org/10.3390/jcm13123425.

22. KikueYamaguchi1 Motohiro Munakata1 Yu KataokaTakashiUesugiand Yoshiaki Shimoo1Efects of missing teeth and nasal septal deviation on maxillary sinus volume: a pilot study(2022) https://doi.org/10.1186/s40729-022-00415-5.

23. Miguel Velasco-Torres, DDS, PhD, Miguel Padial-Molina, DDS, PhD, Gustavo Avila-Ortiz, DDS, MS, PhD, Raúl García-Delgado, Francisco O'Valle, MD, PhD, Andrés Catena, PhD, and Pablo Galindo-Moreno, DDS, PhD. Maxillary Sinus Dimensions Decrease as Age and Tooth Loss Increase. 2017 DOI: 10.1097/ID.0000000000000551

24. Eleni Panoua, Melih Motrob, Mustafa Ates¸ c, Ahu Acard, Nejat Erverdid. Dimensional changes of maxillary sinuses and pharyngeal airway in Class III patients undergoing bimaxillary orthognathic surgery. February 2013http://meridian.allenpress.com.

25. Amaya Iturralde-Garrote, José Luis Sanz 1, Leopoldo Forner, María Meloand Clara Puig-Herreros. Volumetric Changes of the Paranasal Sinuses with Age: A Systematic Review. 2023 https:// doi.org/10.3390/jcm12103355.

26. Jyotsna Kitchlu, Bonita Gupte, Apurab Gupta, Ashwani K. Sharma. Dimensions of maxillary sinus in correlation to age by computed tomography (CT scan). 2022.

27. Rubira-Bullen, IRF. Rubira, CMF. Sarmento, VA. and Azevedo. Frontal sinus size on facial plain radiographs2010.
28. Dr.Mohammad Ahmad Abdalla Human Maxillary Sinus Development, Pneumatization, Anatomy, Blood Supply, Innervation and Functional Theories: An Update Review 2022.

29 PHRABIIAKARAN NAMBIAR,I MI]RALI D.K. NNDU,z AND KRISHNAN Sf]BRAMANIIAMz,F. Anatomical Variability of the Frontal Sinuses and Their Application in Forensic IdentificationDecember 1999https://www.researchgate.net/publication/13397840.

30. Michael J. Marino, MD, Charles A. Riley, MD, Eric L. Wu, MD, Jacqueline E. Weinstein, MD, Noah Emerson, DO, Edward D. McCoul, MD, MPH Variability of Paranasal Sinus Pneumatization in the Absence of Sinus Disease2020DOI:10.31486/toj.19.0053.

31. Konstantinos Natsis, MD, PhD, BSc, FFIMS, FEBSM, Maria Piagkou, DDS, MD, MSc, PhD, Ioannis Chryssanthou, DDS, Georgios P. Skandalakis, BBA, MSc), Georgios Tsakotos, MD, PhD, Giannoulis Piagkos, MD, MSc, PhD, Constantinus Politis, MD, DDS, MM, MHA, PhD 2018 A simple method to estimate the linear length of the orbital floor in complex orbital surgery DOI: https://doi.org/10.1016/j.jcms.2018.11.001.

32. Mukul Prabhat, Shalu Rai, Mandeep Kaur1 , Kanika Prabhat2 , Puneet Bhatnagar, Sapna Panjwani Computed tomography based forensic gender determination by measuring the size and volume of the maxillary sinuses 2016.

COMPARATIVE STUDY OF MAXILLARY AND FRONTAL SINUS VOLUME MEASUREMENT BY USING NCCT HEAD

ORIGINALITY REPORT

1%

SIMILARITY INDEX

PRIMARY SOURCES

1	www.mdpi.com Internet	30 words — < 1%
2	lup.lub.lu.se Internet	21 words — < 1%
3	www.researchgate.net Internet	16 words — < 1%
4	pubmed.ncbi.nlm.nih.gov Internet	14 words — < 1%

EXCLUDE QUOTES	ON	EXCLUDE SOURCES	< 10 WORDS
EXCLUDE BIBLIOGRAPHY	ON	EXCLUDE MATCHES	< 14 WORDS

LETTER OF ETHICAL CLEARANCE FOR DISSERATATION FROM REGISTAR OFFICE

SANTOSH
Deemed to be University
(Established u/s 3 of the UGC Act, 1956)

F.No. SU/ R/ 2024/3144[51] Dated: 17.05.2024

Subject: Grant of Ethical Clearance for **Dissertation Protocol** Topic **"COMPARATIVE STUDY OF MAXILLARY AND FRONTAL SINUS VOLUME MEASUREMENT BY USING NCCT HEAD",** submitted by **SONAM TRIPATHI**, student of M.Sc. Medical Imaging Technology2022 Batch.

****

With reference to the request for grant of Ethical clearance for the DissertationProtocol entitled**"COMPARATIVE STUDY OF MAXILLARY AND FRONTAL SINUS VOLUME MEASUREMENT BY USING NCCT HEAD",Ms. Sonam Tripathi** is informed that the Dissertation Protocol submitted by him/her was considered by the **screening committee** of the **Allied Health Sciences**in its meeting held on 07.02.2024. and the same was 29.02.2024.The recommendations of the **Screening Committee** were considered in detail by the **Institutional Ethics Committee** in its meeting held on 15.05.2024 and the same was approved by the **Ethics Committee** of the **Santosh deemed to be university, ghaziabad, Delhi NCR.**

He/She is informed accordingly for further necessary action.

[Dr. EZHILRAJAN.K]

SONAM TRIPATHI **REGISTAR**

M.Sc Medical Imaging Technology.

Copy to:

1.The vice Chancellor

2.The Dean-Academics

3.The Dean-SMC&H

4. The Dean-Research

5.The Director-IQAC

6 HOD/ Course In-charge of the concerned Department..

MASTER CHART

Tasks	Tasks Duration	Start Date	End Date	Aug-Sep	Oct-Nov	Dec-Jan	Feb-Mar	Apr-May	Jun-Jul	Aug-Sep
Preparation ofthesisproposal	21	15-07-23	05-08-23							
Presentation ofthesisproposal	25	05-08-23	30-08-23							
Preparation &Submission ThesisApplication inEthicsCommittee	41	30-08-23	10-10-23							
Reviewof Literature	30	10-10-23	07-01-24							
DataCollection	284	17-02-24	24-05-24							
DataAnalysis	7	24-06-24	31-06-24							
Finding &Recommendations	10	31-07-24	10-08-24							
ReportWriting	30	31-07-24	30-08-24							
Submission ofthesis	5	30-08-24	04-09-24							
Presentationof thesis	0									

DATA SHEET